MINNESOTA POLLUTION CONTROL AGENCY

EXPANDED SITE INSPECTION REPORT
FOR
PIGS EYE LANDFILL
St. PAUL, MINNESOTA

U.S. EPA ID# MND980609085

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PIGS EYE LANDFILL
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EXPANDED SITE INSPECTION REPORT

Pigs Eye Landfill
St. Paul, Minnesota
MND980609085

1.0 INTRODUCTION

On June 1, 1981, the Pigs Eye Landfill (Site) located in St. Paul, Minnesota, was placed on the U.S. Environmental Protection Agency's (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) inventory of potential hazardous waste sites. A Preliminary Assessment (PA) was done on the Site by Minnesota Pollution Control Agency (MPCA) staff in 1983. In December 1988 and January 1989, a Screening Site Inspection (SSI) was conducted at the Site by the MPCA.

The SSI consisted of installing soil borings and monitoring wells on the Site and sampling nearby surface waters. Results of the SSI indicated a release of hazardous substances to soil and ground water from disposal activities at the Site. As a result of a documented release of hazardous substances at the Site, MPCA staff determined an Expanded Site Inspection (ESI) was necessary at the Site to further assess potential environmental impacts.

The general goals of an ESI are outlined below:

1. Collect additional data beyond the scope of the SSI to enable a more refined Hazard Ranking System (HRS) score; and

2. assess the likelihood of the site to qualify for the National Priorities List (NPL).

An ESI was initiated in June 1992, with sampling activities conducted in August 1992. Sampling during the ESI consisted of the collection of on site surficial soil samples and sediment samples in adjacent surface waters. Sample results from the ESI did indicate a release of hazardous substances to surficial soils and surface waters. Additional non-sampling data was also collected during the ESI to determine environmental targets, either actually or potentially, impacted by the site.

2.0 SITE BACKGROUND

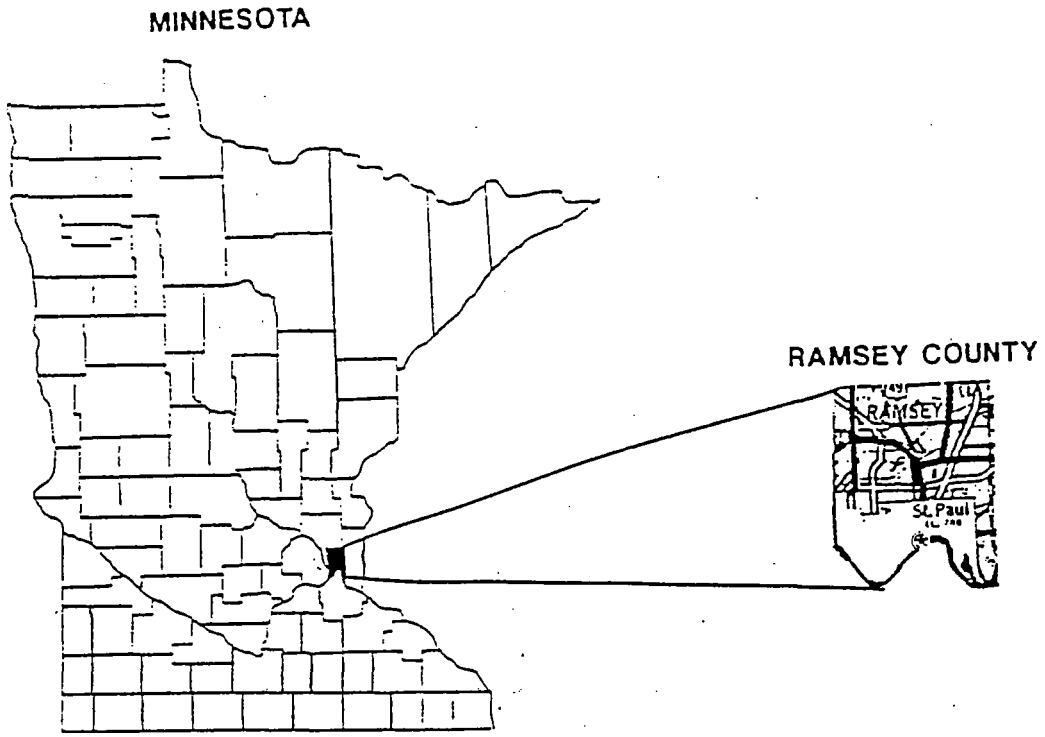
2.1 Site Location

The Site is an inactive landfill located near the intersection of Warner Road and Childs Road in the city of St. Paul, Minnesota. The Site is located along the east bank of the Mississippi River and bordered to the north and east by the Soo Line Railyards, to the southwest by the Metropolitan Waste Control Commission (MWCC) Pigs Eye Sewage Treatment Plant, and to the south by Pigs Eye Lake. The city of St. Paul currently operates a wood chipping facility on the western portion of the Site. Downtown St. Paul, the State Capitol complex and numerous State, Federal and local government office buildings, including the MPCA building, are also located within 3 miles of the Site to the northwest.(Ref. 1,2,3,4,5)

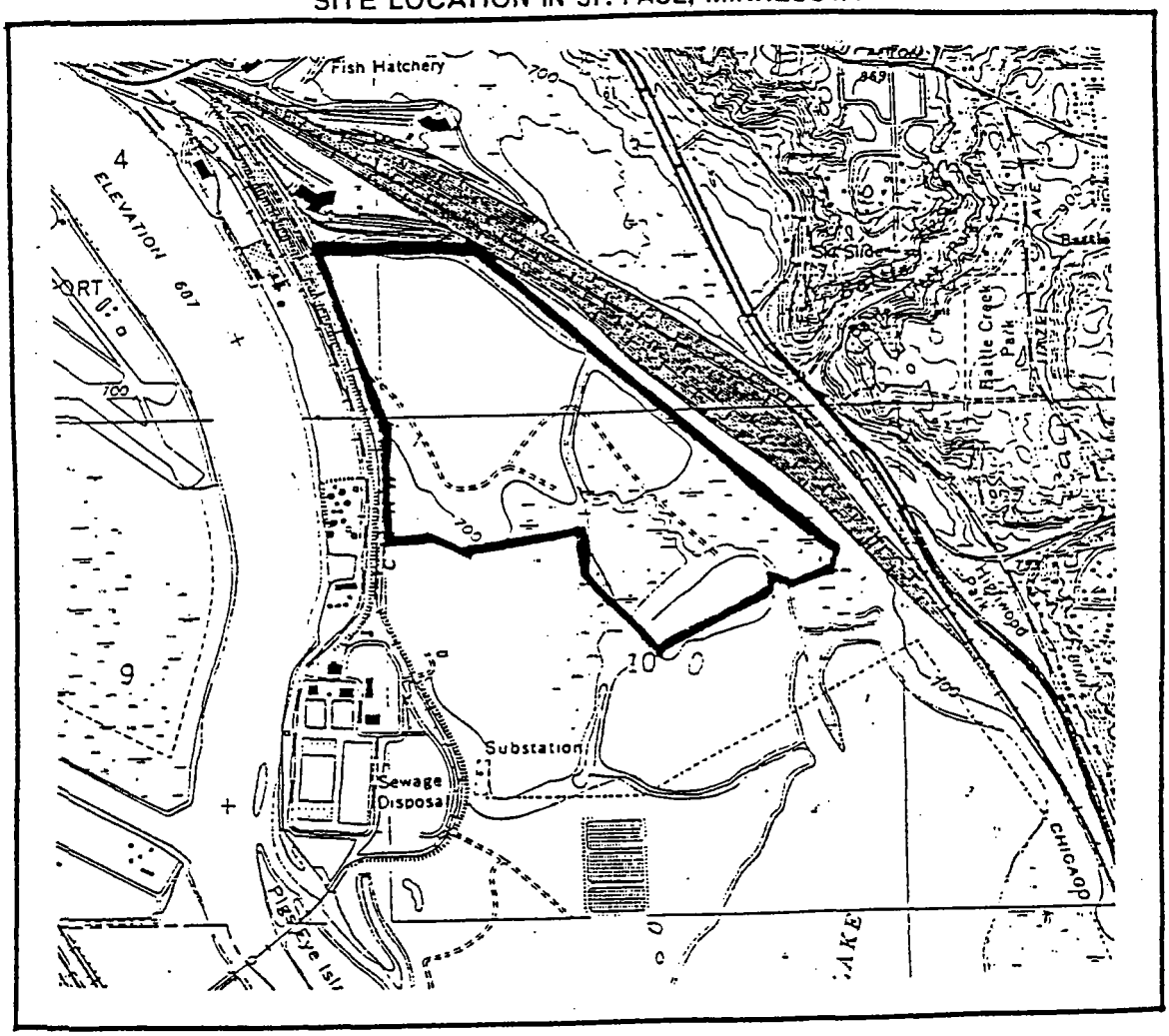
2.2 Site Description

The Site consists of the abandoned landfill and is approximately 307 acres in size. The landfill was not lined during its operation. There is currently no fencing around the site and it is readily accessible to the public. The adjacent Pigs Eye Lake is used for recreational purposes, including public fishing. The landfill was a wetland prior to waste disposal as is evident by the marsh-like grasses and other vegetation visibly growing on-site and along Battle Creek. Battle Creek flows through and adjacent to the Site, until discharging to Pigs Eye Lake. During site reconnaissance visits for the ESI, suspected leachate was noted seeping into Battle Creek. (Ref. 1,2,4,8,9,34,35)

The site is within the boundaries of the Federally designated Mississippi National River and Recreation Area and within habitat areas for both Bald Eagles and Peregrine Falcons. A State of Minnesota Department of Natural Resources (DNR) managed heron rookery is also located along the western shore of Pigs Eye Lake and within two miles of the site. (Ref. 1,2,10,11,12)



SITE LOCATION IN ST. PAUL, MINNESOTA



SOURCE: MPCA 1989

FIGURE 2-1: SITE LOCATION

2.3 Site History

Pigs Eye Landfill operated from approximately 1956 until closed by the MPCA in 1972. The site operated prior to the formation of the MPCA and therefore was not a permitted landfill. The landfill accepted mixed municipal and industrial wastes from the city of St. Paul and surrounding suburbs. An estimated 8.23 million cubic yards of waste material were taken to the landfill during the 16 year history of the landfill. As previously indicated, wastes were disposed directly to the wetland area. (Ref. 1,2,8,17,21,35)

Records and photos obtained from the city of St. Paul confirmed the area was a wetland prior to waste disposal and waste materials were deposited directly to the wetlands. One letter dated June 14, 1956, even stated that this area was well suited for a landfill since it was submarginal property and a potential public health problem because the marshes were conducive to mosquito breeding. (Ref. 9)

After closure of the landfill, MWCC was permitted by the MPCA, to dispose of sewage sludge ash on a portion of the abandoned landfill. Approximately 236,462 cubic yards of ash were deposited. The ash was essentially landspread and covered with approximately 6 inches of topsoil. The landspreading operation took place on approximately 31 acres of the abandoned landfill between the years of 1977 and 1985. (Ref. 1,2,17,18,20)

In July 1988, the Site caught fire from unknown sources. A MPCA contractor conducted air sampling using Draeger tubes to identify potential contaminants being emitted from the Site. The contractor, Bay West, did detect hydrogen cyanide in the smoke plume. (Ref. 1,2,28)

Records and site photos obtained from the city of St. Paul also indicated the Site caught fire at various times during operation of the landfill. (Ref. 1,2,9)

After the completion of the SSI, the Site was added to the State of Minnesota's Permanent List of Priorities (PLP), or the State Superfund List, in December 1989 for a Remedial Investigation/Feasibility Study (RI/FS) under the direction of the MPCA's Site Response Section.

Initially, the Site Response Section issued Requests to Provide Information (RPI), as permitted under the Minnesota Environmental Response and Liability Act (MERLA), in an attempt to identify Potential Responsible Parties (PRP). Responses to the RPIs did indicate that industrial wastes were deposited in the Pigs Eye Landfill during its operation. (Ref. 19,20,21)

Subsequent to the Site's listing on the PLP and issuance of RPIs to PRPs, the Site Response Section requested the MPCA's Site Assessment Unit assistance in adding the Site to the National Priorities List (NPL). To date, Site Response staff have not conducted sampling activities at the Site.

2.4 Screening Site Inspection Summary

In December 1988 and January 1989, MPCA Site Assessment staff members Meri Lapp Nielsen and Susan Price conducted field sampling procedures for the SSI at the Site. The SSI field work consisted of installing 3 on-site soil borings, 3 permanent on and off site monitoring wells, and sampling surface water in Battle Creek. Nearby residential wells were also sampled during the SSI.

Soil samples were taken from the 3 soil borings and from the 3 permanent monitoring wells. Temporary monitoring wells were also installed at the 3 soil borings. The soil samples were taken from within the fill material at each of the on site borings.

Results from soil samples from on-site soil borings indicated both inorganic and organic compounds in fill material. Lead, Mercury, Endrin Ketone, and bis(2-Ethylhexylphthalate) were found at levels greater than 3 times those levels found in off site soil samples. In addition, other organic compounds including Naphthalene and 2-Methylnaphthalene were also detected in on site soil samples, which were not detected in off site samples. These compounds, however, were detected below CLP Contract Required Quantitation Limits (CRQL).

Ground water samples collected from monitoring wells also indicated hazardous substances present at the site. Samples from permanent on-site monitoring wells, partially screened in fill material, indicated levels of inorganic substances such as arsenic(194 ug/l), chromium(269 ug/l), cyanide(69.8 ug/l), lead(776 ug/l), mercury(4.7 ug/l), cobalt(155 ug/l) and vanadium(429 ug/l). These concentrations were at levels greater than 3 times those concentrations found in an off site monitoring well.

Temporary monitoring wells were also installed at on-site soil borings for collecting ground water samples. Organic compounds detected at these locations included Methylene Chloride, Naphthalene, 2-Methylnaphthalene, 1,2-Dichlorobenzene and Aroclor 1016 which were detected above the CRQL. Inorganic compounds were also detected at the following elevated levels: cobalt at 674 ug/l, mercury at 130 ug/l, vanadium at 372 and cyanide at 110 ug/l. In addition, cadmium, chromium, copper, lead, nickel and lead were detected at high levels. However, the SSI Report indicated samples from the temporary monitoring wells were very turbid and may not represent an accurate ground water sample. These samples do indicate, however, that these substances are present at the site and in the fill material.

Surface water samples were also collected during the SSI field work. Samples were taken in Battle Creek, near an apparent leachate seep. Sample results, however, did not document an observed release of contaminants to surface water, at that time.

Sediment samples or surficial soil samples were not collected during the SSI field work.

The narrative portion of the SSI Report, which includes summary data tables, is included in Appendix C.

3.0 WASTE CHARACTERISTICS

3.1 Waste Description

As stated previously, the Site is approximately 307 acres in size. During the landfill operation, an estimated 8.23 million cubic yards of waste material was deposited at the Site. Wastes were from municipal, commercial and industrial sources located in St. Paul and the surrounding area. (Ref. 1,2,17,19,21,34)

Following closure of the landfill, MWCC was permitted by the MPCA to dispose of ash from incinerated sewage sludge. The ash was from the nearby Pigs Eye Sewage Treatment Plant. The ash was landspread over approximately 31 acres of the abandoned landfill. Topsoil was spread over the ash and seeded for cover. (Ref. 20,34)

In response to listing the Site on the PLP and receiving a RPI from the MPCA, MWCC stated that approximately 238,462 cubic yards of ash were landspread at the Site. The ash contained various metals notably cadmium, chromium, copper, lead, nickel and zinc in high concentrations. (Ref. 18,20)

As a requirement of the MPCA permit, MWCC conducts quarterly sampling of ground water and surface water at the Site. (Ref. 34)

4.0 HYDROLOGIC SETTING

4.1 Surface Water

The proximity of the Site to the Mississippi River, which is located 1/2 mile to the west, is the dominant factor relating to surface water at and surrounding the Site. The Site is located in a low lying area which is part of an alluvial bar deposited and formed by the Mississippi River. Pigs Eye Lake is located along the southern border of the Site and is connected to the Mississippi River through a channel located on the south side of the lake. (Figure 4.1)

The Site, alluvial bar and Pigs Eye Lake are all located within the 100 year flood plain of the Mississippi River. Much of the Site lies within the 50 year flood plain and a portion of the Site lies within the 10 year flood plain. The 100 year flood level at this point of the Mississippi River is at an elevation of 706 feet above mean sea level, the 50 year is at 704 feet and the 10 year is at 699 feet. At normal stage level, the Mississippi River and Pigs Eye Lake are at a elevation of 687 feet above mean sea level. The elevation of the Site ranges from 687 to approximately 705 feet. The water level in Pigs Eye rises and falls with the Mississippi River. These levels are dependent on runoff to the river and to a large extent, by a series of locks and dams controlled by the U.S. Army Corps of Engineers which are used for navigational and flood control purposes. (Ref. 22) The Site was completely inundated by flood waters in April 1965. (Ref. 1,2,25)

Battle Creek enters the Site from the east and originates from Battle Creek Lake, located approximately four miles east of the Site. The creek enters the Site, flowing westward through a manmade conduit beneath the Soo Line Railroad yards. Prior to about 1967 the creek flowed diagonally across the Site from the northwest to the southeast. The creek was rerouted sometime between 1967 and 1972 and presently flows south from the conduit, across the site, before turning sharply to the east and then enters Pigs Eye Lake. (Figure 4.1) Battle Creek is a minimal stream, having a flow rate of 1 to 10 cubic feet per second (cfs), thus contributing little influence to Pigs Eye Lake or the Mississippi River. The discharge rate of Pigs Eye Lake to the Mississippi River is 1 to 10 cfs. (Ref. 23) The average annual flow of the Mississippi River near the Site is 11,132 cfs. (Ref. 24)

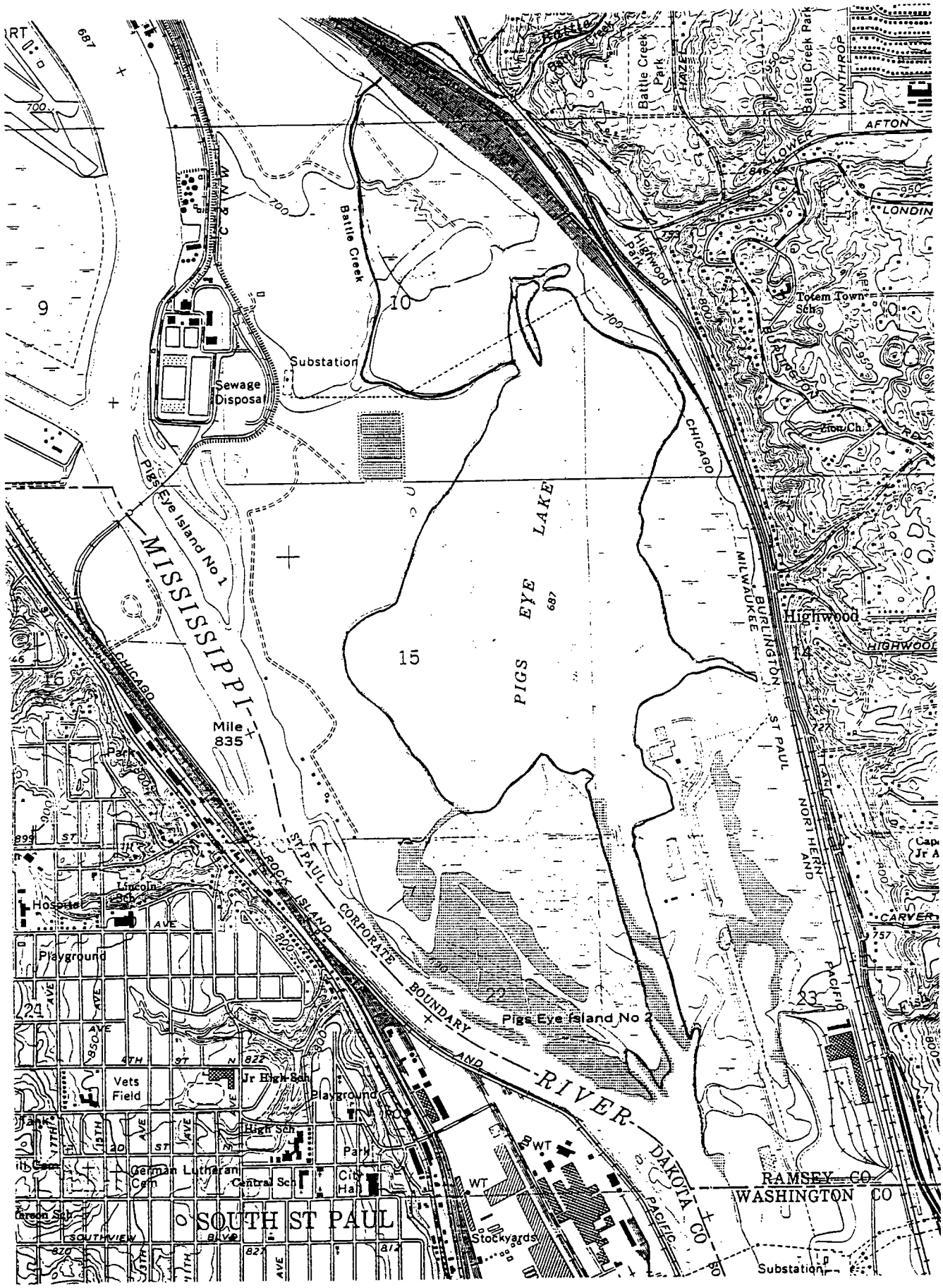


Figure 4.1 Hydrologic Features Map

Pigs Eye Lake is approximately 511 acres in size and has about 5 miles of shoreline. (Ref. 23) Much of the eastern and a portion of the southern shoreline is a wetland area, having a total shoreline of about 2.5 miles. (Ref. 3)

Based on ground surface elevations taken at monitoring wells installed previous to this investigation, the Site slopes gently in a southerly direction except along the banks of Battle Creek where steep slopes exist. Most rain water infiltrates into the ground surface, runs off to numerous small depressions located across the Site, or is lost to evapotranspiration. Some rain water run-off directly to Battle Creek and Pigs Eye Lake may occur during periods of heavy precipitation. Based on the potentiometric contours of the surficial ground water at the Site, rain water which infiltrates to ground water eventually discharges along Battle Creek and to Pigs Eye Lake. (Ref. 17) Leachate seeps along Battle Creek provide further evidence of this occurrence. (Ref. 4,5)

4.2 Ground Water

The ground water flow direction in the surficial, unconsolidated aquifers and in the underlying sedimentary bedrock formations is largely influenced by the Mississippi River both regionally and in the proximity of the Site. Both the surficial and the upper sedimentary bedrock formations discharge toward the Mississippi River. (Figures 4.2, 4.3 & 4.4)

The primary aquifer used for drinking water in the area of the Site and the aquifer of concern for the purposes of this report should be considered the Prairie du Chien Group, the Jordan Sandstone and the overlying unconsolidated deposits. The Prairie du Chien Group is comprised of the Shakopee and Oneota Formations. The Shakopee Formation consists of dolomitic sandstone and the Oneota is primarily dolomite. The underlying Jordan Formation is a fine to medium grained quartzose sandstone. Underlying the Jordan Formation, the St. Lawrence Formation acts as a confining bed and is continuous in the area of the Site. Refer to Figure 4.5 for additional hydrogeologic information.

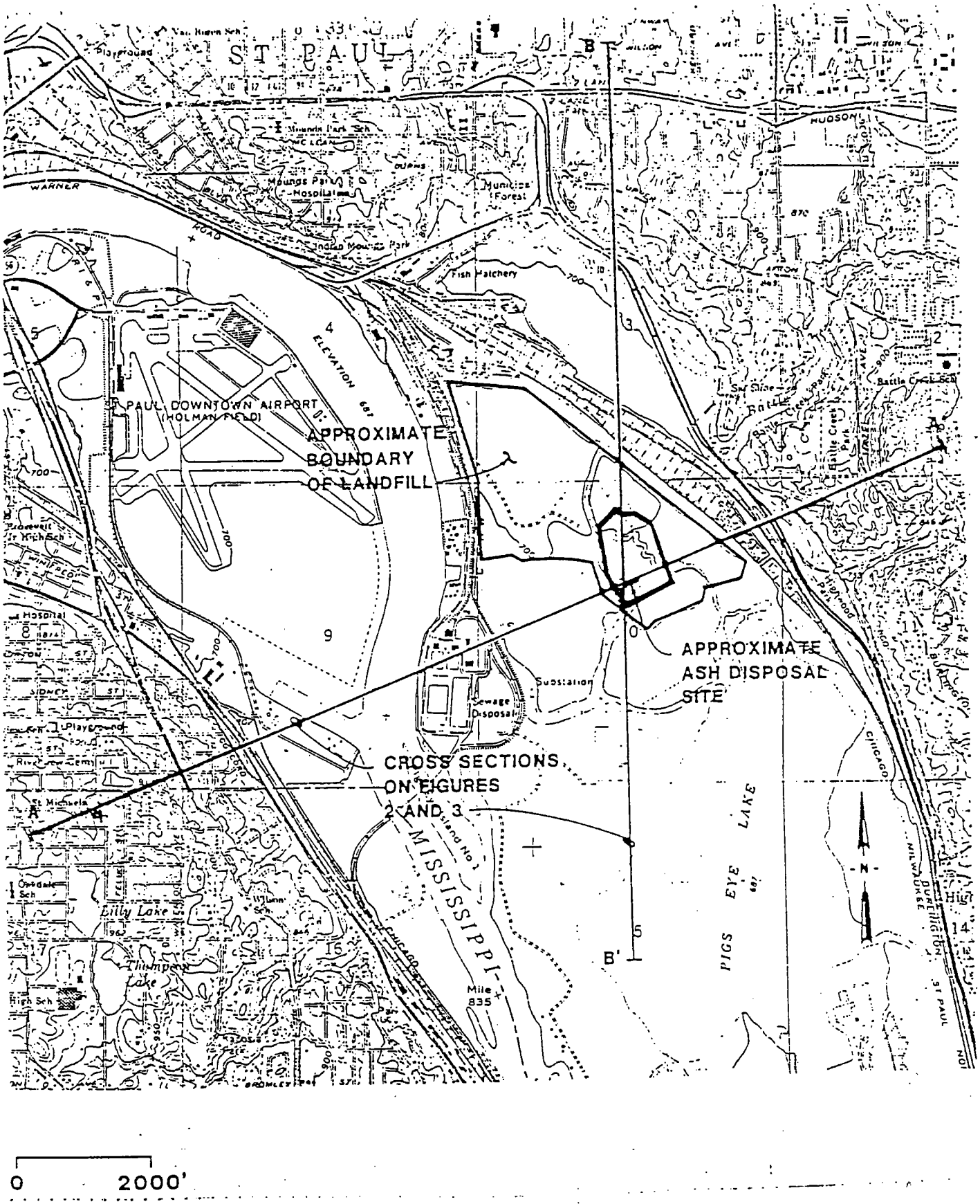


Figure 4.2 Cross-Section Location Map

Adapted from Consulting Engineers Diversified, Inc./ CH2M Hill, Inc., 1979.

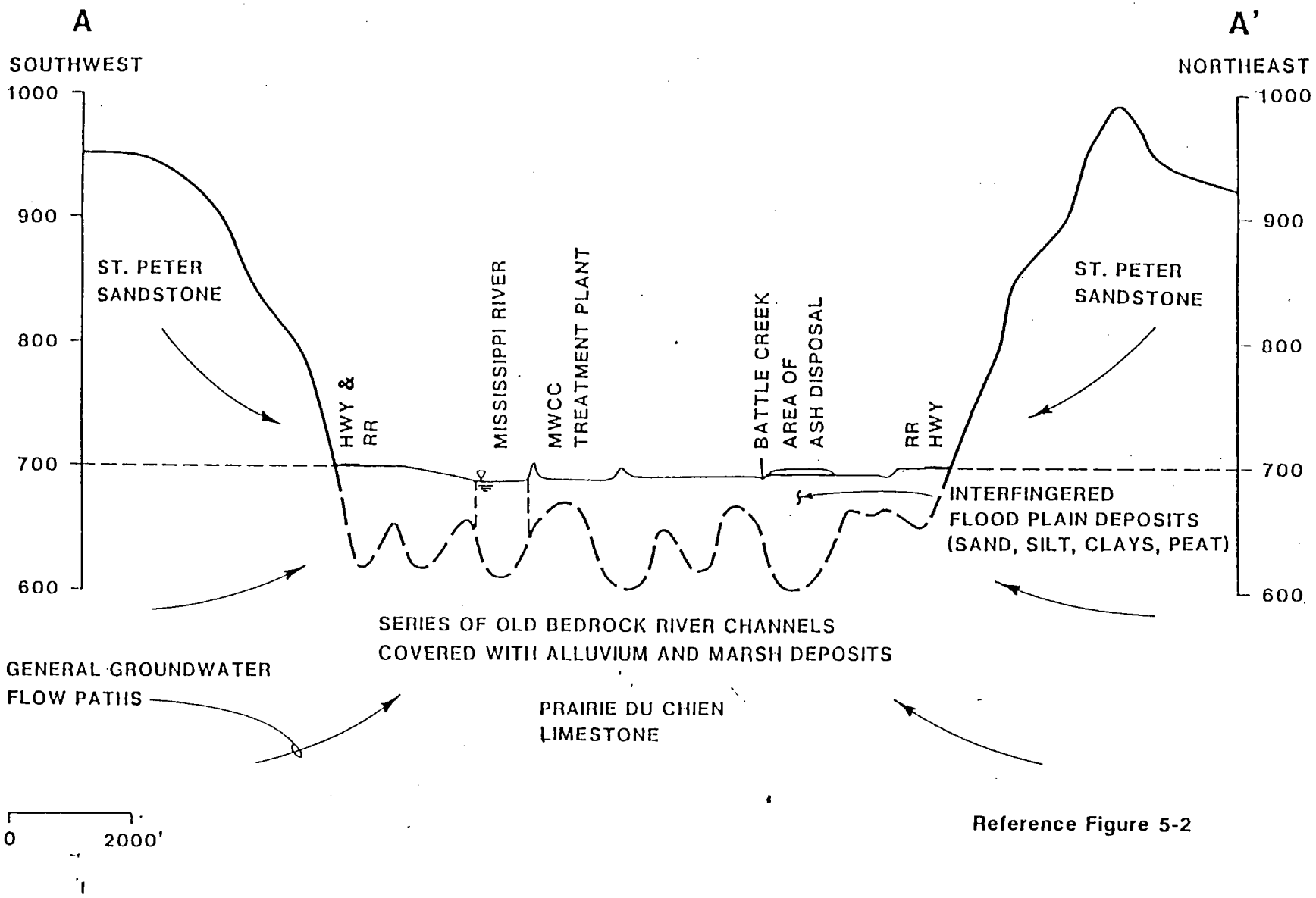
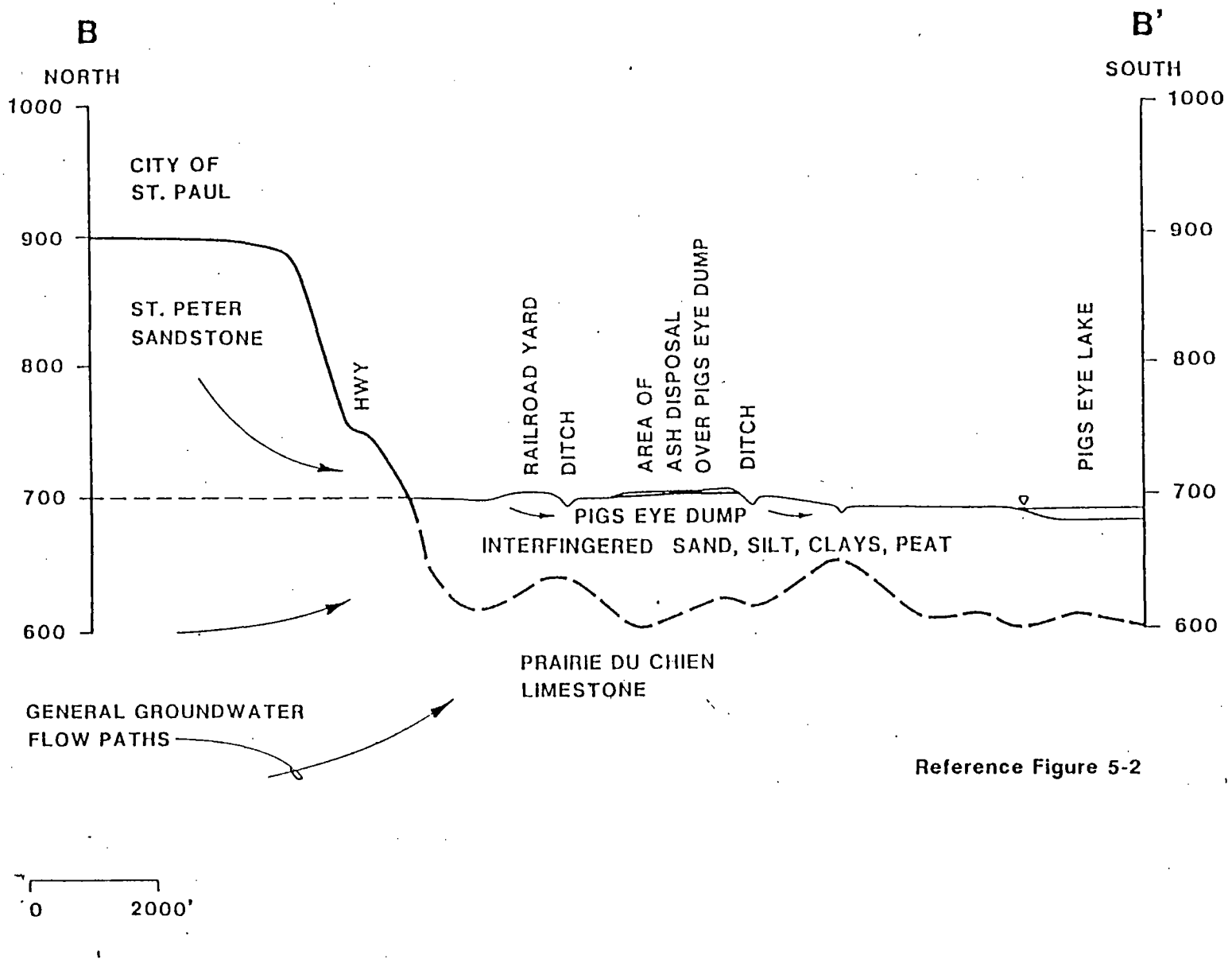


Figure 4.3 Southwest-Northeast Cross-Section

Adapted from Consulting Engineers Diversified, Inc./ CH2M Hill, Inc., 1979.



Reference Figure 5-2

Figure 4.4 North-South Cross-Section

Adapted from Consulting Engineers Diversified, Inc./ CH2M Hill, Inc., 1979.

Previous soil borings drilled on-site indicate that the unconsolidated deposits vary greatly across the Site. Lenses of sand, silt, clay, muck, and peat are interfingered to bedrock, which is the Prairie du Chien Group. The depth to bedrock varies across the Site from about 20 to just over 100 feet. .(Ref. 1,2,17)

The depth to surficial ground water at the Site ranges from about 5 to 15 feet. Based on water level measurements taken in the various monitoring wells and piezometers located on-site, the general ground water flow direction in the surficial aquifer is to the southwest, toward the Mississippi River. An exception to this was during the period of April and May, 1979, when the flow direction reversed and was to the northeast. This reversal may be a seasonal event related to the pool elevation of the Mississippi River. (Ref. 1,2,17)

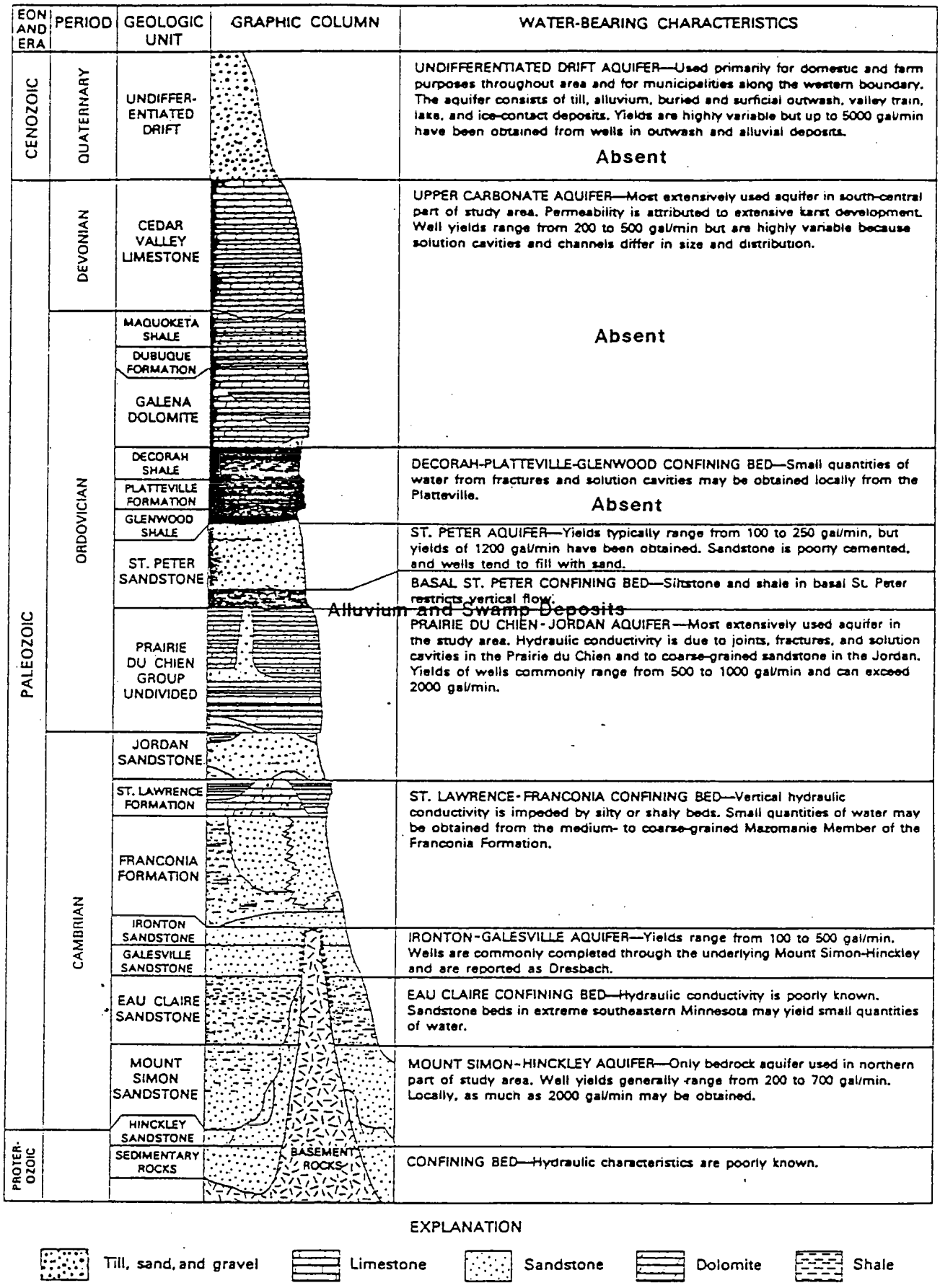


Figure 4.5 Hydrogeologic Column

5.0 ESI FIELD WORK

5.1 Site Reconnaissance

MPCA staff members conducted field reconnaissance visits at the Site on June 23, 1992 and again on July 16, 1992. These site visits were done to familiarize staff with the Site and to assist in determining sampling locations.

On each occasion staff members noted suspected leachate seeping into Battle Creek, in an area close to the ash disposal area. (Ref. 4)

5.2 Sampling Activities

An ESI work plan was prepared and submitted for review to U.S. EPA. The work plan called for the collection of sediment surface samples from Battle Creek and Pigs Eye Lake. Sediments would be collected where there visually appeared to be leachate seeps and/or at random points along the shore line of the creek and lake. Potential background samples were to be collected in Battle Creek at points prior to and after discharge from the Soo Line Railyards. A background sediment sample for Pigs Eye Lake would be collected on the south side of the lake, near a boat landing used by the public.

Surficial soil samples were also going to be collected on-site in the area of the ash disposal. Samples would be collected from the upper 2 feet of soil to assist in documenting a soil pathway score and to determine a concentration of metals in ash deposited.

The work plan did include a proposal for sampling the surface waters of Battle Creek and Pigs Eye Lake, but a determination was made by MPCA staff that sediment sampling was sufficient for the purposes of documenting a release to surface water and wetlands.

The ESI work plan was approved by Jeanne Griffin, Site Assessment Manager for U.S. EPA, Region V, on July 8, 1992. (Ref. 4,5)

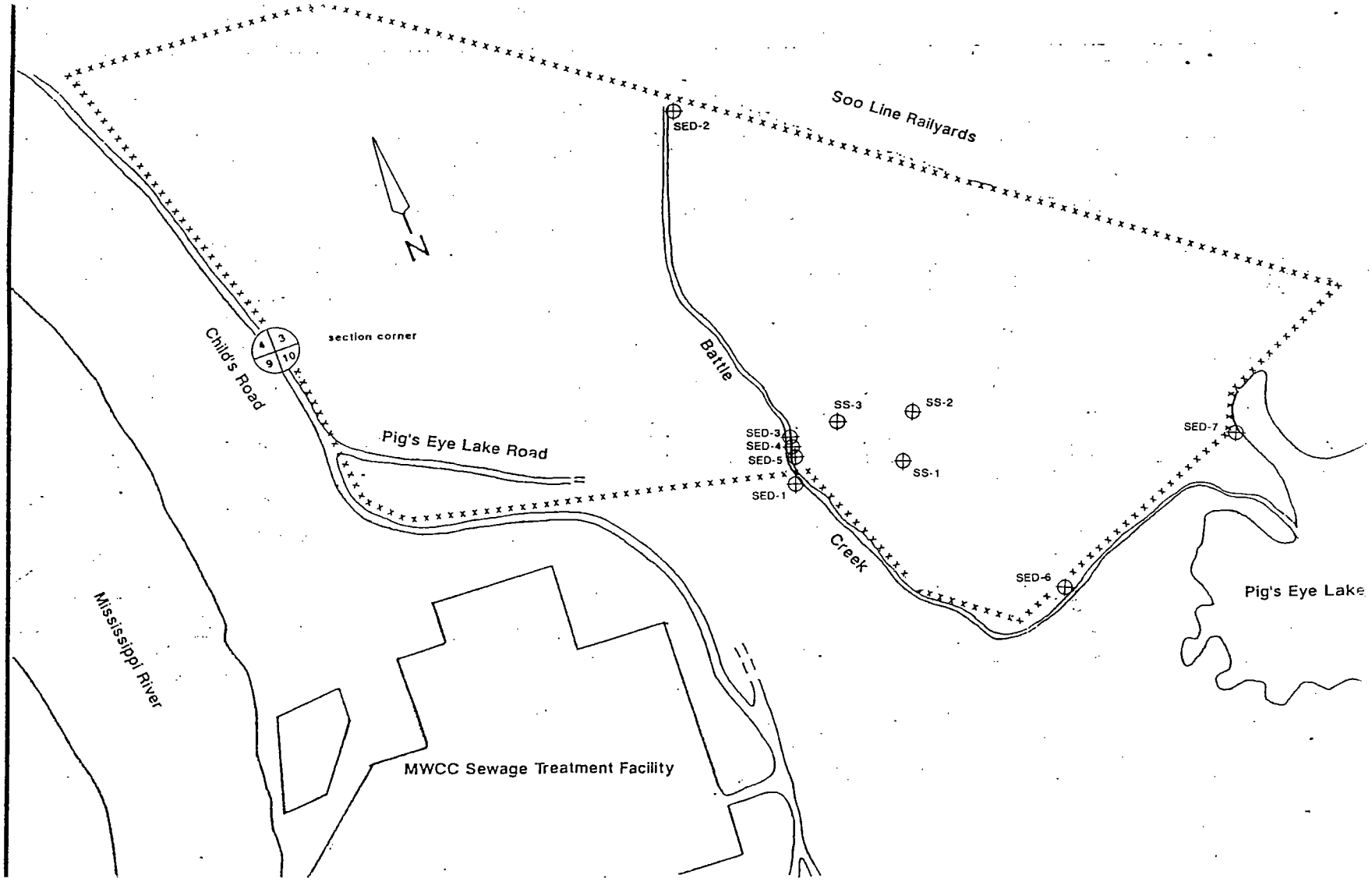


Figure 5.1 Soil and Sediment Sample Locations

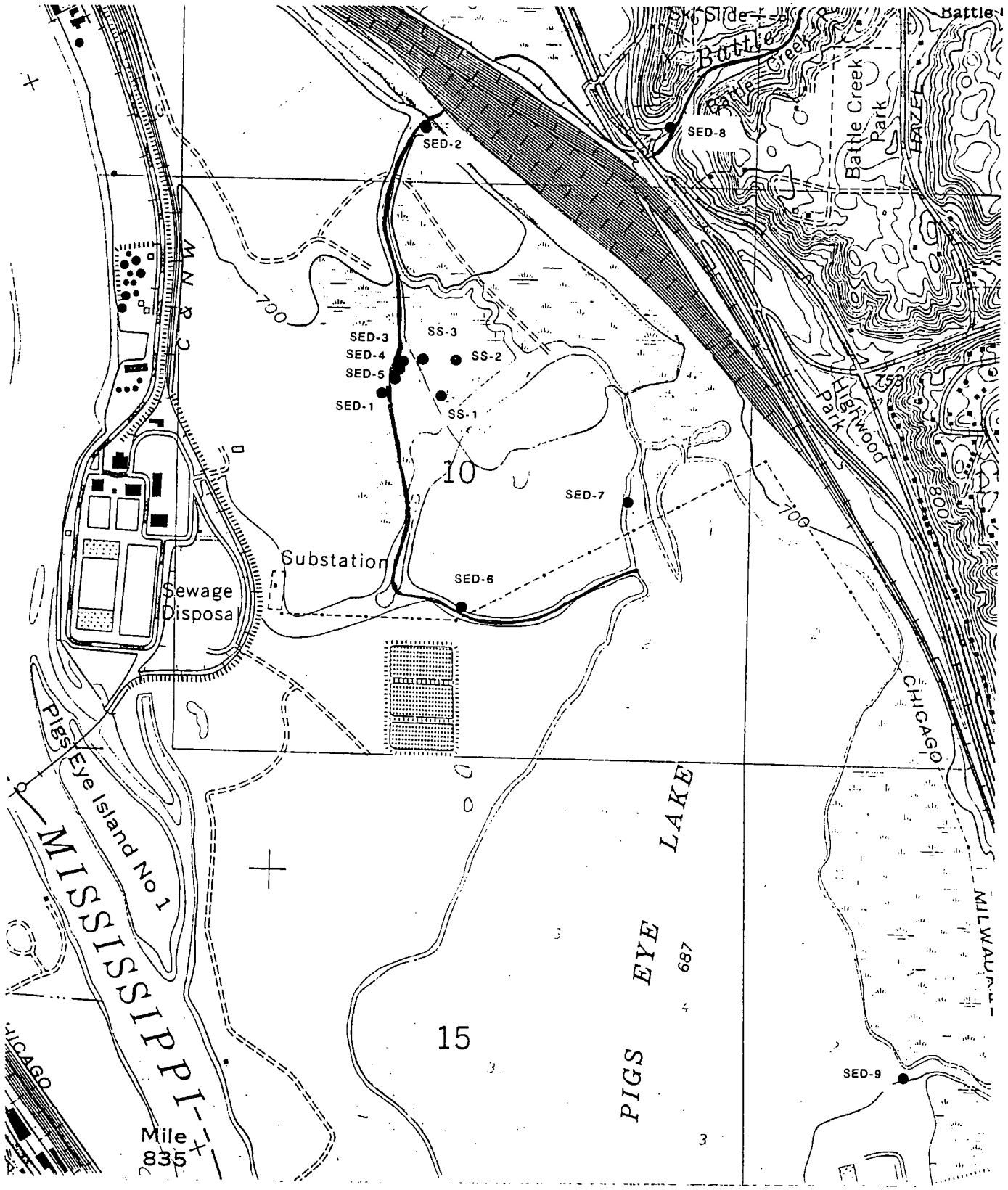


Figure 5.2 Soil and Sediment Sample Locations

Refer to Figures 5.1 and 5.2 for Site maps and approximate sampling locations.

5.3 Sample Results

Soil and sediment samples were collected and shipped according to the approved ESI workplan and U.S. EPA Contract Laboratory Program (CLP) guidelines. Inorganic analysis (Target Analyte List) was done by Associated Laboratories, Inc. (ALI) of Orange, California. Organic analysis (Target Compound List) was done by Clayton Environmental Consultants of Novi, Michigan. Data validation was done for the MPCA by Malcolm Pirnie of Minneapolis, Minnesota. Table 5.1 indicates contaminants detected above the Contract Required Detection Limit (CRDL). A complete data validation package is included in Appendix F.

5.3.1 Soil Samples

Three soil samples (SS-1, SS-2, SS-3) were collected within 8 to 11 inches of the surface in the ash disposal area. A hand auger was used to dig down to what appeared to be ash. Samples were collected when grayish material was encountered. Samples SS-1 and SS-2 were analyzed for complete TCL and TAL compounds, while SS-3 was just analyzed for metals, semi-volatiles and pesticides. These three surficial soil samples confirmed the presence of the metals suspected to be in the ash. Levels of lead and silver were found to be up to 346 mg/kg and 46.2 mg/kg. These highest levels of lead and silver were found in sample SS-3, which when sampled appeared to contain entirely ash material. Mercury was also found in samples SS-1 and SS-2 at levels of 0.09 and 0.08 mg/kg respectively.

Several other metals were also found to be in high concentrations, notably cadmium, chromium, copper, nickel and zinc. The highest concentrations of these metals were also found in sample SS-3. However, sample results for these compounds were marked with a "J" qualifier upon data review. The "J" qualifier was based on the high recovery rates during instrument calibration and therefore these results were noted as Biased - High. Even though these compounds were biased, sample results confirmed the metals content of the ash in high concentrations.

PIGSEYE LANDFILL

SUMMARY OF CHEMICAL ANALYTICAL DATA
WITH CONCENTRATIONS EXCEEDING CRDL
FROM SOLID SAMPLES
CLP RAS ANALYSES

Organic Sample Number	EMT97	Q	EMT98	Q	EMT99	Q	ERL01	Q	ERL02	Q	ERL03	Q	ERL04	Q	ERL05	Q	ERL06	Q	ERL07	Q	ERL08	Q	ERL09	Q
Inorganic Sample Number	MEKY79		MEKY80		MENL65		MENL66		MENL67		MENL68		MENL94		MENL95		MENL96		MENL97		MENL98		MENL99	
Date	08/10/92		08/10/92		08/10/92		08/10/92		08/10/92		08/10/92		08/10/92		08/10/92		08/10/92		08/10/92		08/10/92		08/10/92	
Time	0935		1015		1100		1110		1120		1145		1200		1230		1300		1315		1400		1430	
Sample Location	SED-1		SED-2		SED-3		SED-4		SED-5		SS-1		SS-2		SS-3		SED-6		SED-7		SED-8		SED-9	
VOLATILES – Concentration in µg/kg																								
Methylene Chloride											29								50		28		44	
Acetone							120	J	140															
Toluene	33	J																						
Chlorobenzene	210																							
SEMI-VOLATILES – Concentration in µg/kg																								
Phenanthrene	1,300		1,600		800		560		3,900				500				1,200							
Fluoranthene	2,600		2,700		1,900		1,300		6,600				660				2,000		1,400					
Pyrene	2,300		1,700		1,700		990		5,000				600				2,000		1,600					
Benzo(a)anthracene	1,200		910		970		550		2,700								1,000		1,300					
Chrysene	1,600		890		1,000		630		3,000								1,100							
bis(2-Ethylhexyl)phthalate									4,500								1,500		8,600					
Benzo(b)fluoranthene	2,600		1,100		2,600		1,600		1,200	J							2,200		1,500					
Benzo(k)fluoranthene			520						4,100															
Benzo(a)Pyrene	1,400		780		950		570		2,200								870							
Indeno(1,2,3-cd)pyrene	2,200	J			1,400	J	830	J	3,100	J							1,000	J	1,600	J				
Benzo(g,h,i)perylene	1,300		810		890				1,700								550							
PESTICIDES/PCBS – Concentration in µg/kg																								
4,4'-DDE																					7.6			
Endrin			4.40						33.00								7.3							
4,4'-DDD							6.10																	
4,4'-DDT																							11	
alpha-Chlordane	6.90						3.90		4.30								2.6							
gamma-Chlordane							3.50		3.40															
Aroclor-1254													50.00						7900					
INORGANICS – Concentration in mg/kg																								
Aluminum	8590	J	2180	J	2190	J	7460	J	2570	J	8730	J	7650	J	25000	J	3580	J	11500	J	3600	J	4450	J
Antimony	21.7	W	7.8	W	15.1	W	11.1	W	9	W	7.2	W	6.8	W	9.8	W	9	W	33.8	W	8.5	W	14.6	W
Arsenic	22.9	J	1.7	J	4.9	J	4.4	J	3.1	J	3.6	J	2.8	J	11.3	J	2.8	J	4.9	J	0.91	J	2.8	J
Barium	223	J	13.7	J	610	J	133	J	26.3	J	156	J	130	J	580	J	40.6	J	292	J	27.7	J	63.4	J
Beryllium					3.5	J	0.75	J			0.6	J	0.77	J	1.9	J	0.52	J	2	J			0.75	J
Cadmium											6.7	J	6.3	J	25.7	J	1.2	J	9.6	J				
Calcium	22600	J	4460	J	27000	J	21100	J	5080	J	37800	J	30400	J	220000	J	8470	J	23800	J	4730	J	23200	J
Chromium	29.8	J	11	J	19.3	J	45.8	J	9.8	J	152	J	126	J	1170	J	35.8	J	45	J	11.1	J	22.1	J
Cobalt					6.7	J	6.3	J			7.6	J	7.6	J	16.2	J					4	J	6.5	J
Copper	176	J	33.3	J	31.6	J	56.1	J	16.1	J	175	J	126	J	1260	J	46.3	J	154	J	11.6	J	23.4	J
Iron	34400	J	6940	J	156000	J	23600	J	7630	J	17600	J	16000	J	42400	J	9720	J	66400	J	6320	J	12100	J
Lead	68.7		24.2		23.2		36.9		27.1		87.3		50.5		346		25.4		100		95.1		12.7	
Magnesium	7120	J	2120	J	2820	J	6730	J	2330	J	9530	J	7360	J	14300	J	2930	J	6400	J	2290	J	8690	J
Manganese	623	J	132	J	210	J	197	J	210	J	618	J	583	J	770	J	207	J	796	J	86.8	J	543	J
Mercury											0.09		0.08						0.75					
Nickel	44.8	J	8.5	J	8.7	J	17.6	J	6.2	J	49.6	J	41.4	J	316	J	16.8	J	43.9	J	7.1	J	12.1	J
Potassium	970				245		1050		298		737		678		232		285		1070		351		366	
Selenium											0.29	J					0.35	J						
Silver											4.3		3.4		46.2									
Sodium	624	J	223	J	526	J	472	J	218	J	276	J	271	J	602	J	227	J	1470	J	148	J	253	J
Vanadium	28.7	J	13.2	J	11.4	J	27.9	J	14.3	J	24.6	J	23.6	J	44.1	J	16.2	J	32.8	J	16.5	J	17.7	J
Zinc	322	J	30.4	J	108	J	132	J	63.2	J	256	J	212	J	1740	J	93.7	J	879	J	26.8	J	69.9	J

TABLE 5.1

-11.a-

In addition, Aroclor-1254 was found in sample SS-2 at a concentration of 50.00 ug/kg.

5.3.2 Creek Sediment samples

Seven creek sediment samples were also collected during the ESI field work. Samples Sed-1, Sed-3, Sed-4 and Sed-5 were taken in Battle Creek where there appeared to be leachate flowing into the creek. Sample Sed-6 was collected along the southern portion of the Site, in approximately the same area of the MWCC downstream surface water sampling point. Leachate was not seen during the ESI at sampling point Sed-6, but was used for sampling to determine potential downstream migration of contaminants, or migration of contaminants of the landfill via overland flow or ground water discharge to the creek.

Samples Sed-2 and Sed-8 were collected for background creek samples. Sed-2 was collected in Battle Creek at a point after discharge of the creek from the Soo Line Railyards. Sed-8 was collected from Battle Creek in Battle Creek Park, which is to the east of the railyards and prior to the creek entering the underground conduit. These two sampling points were selected to determine if the railyards were potentially affecting surface water quality of the creek.

5.3.2.1 Inorganic sample results

Similar to results found in on-site soil samples, most of the inorganic compounds detected in sediments were marked with a "J" qualifier based on high recovery rates during calibration and therefore are biased high. However, levels of metal concentrations found in sediments taken at apparent leachate seeps were generally higher than levels found in background samples, or were not detected in background samples.

Concentrations of zinc (332 mg/kg) and arsenic (22.9 mg/kg) in sample Sed-1 were found to be greater than 10 times those levels found in background.

Beryllium in samples Sed-3, 4 and 6; cadmium in sample Sed-6; and selenium in sample Sed-6; were also detected and although biased high, were not detected in background creek sediment samples. Other inorganic compounds such as chromium, copper and nickel were found at levels 3 times those found in background.

Inorganic substances found in creek sediment samples were found in on-site surficial soil samples and were reported to be found in ash deposited on-site.

5.3.2.2 Organic sample results

Sediment samples collected at suspected leachate seeps also indicated contamination from organic compounds.

Chlorobenzene was detected in sample Sed-1 at 120 ug/kg and was not detected in background creek samples. Semi-volatiles bis(2-Ethylhexyl)phthalate in samples Sed-5 and 6, and Indeno(1,2,3-cd)pyrene in samples Sed-1, 3, 4, 5 and 6, were detected and not detected in background creek sediment samples. Chrysene and benzo(k)flouranthene were also detected at levels greater than 3 times those found in background.

Pesticides were also detected in creek sediment samples at suspected leachate seeps. Chlordane, an insecticide primarily used for termite control, was found in samples Sed-1, 4, 5 and 6, and not detected in background creek sediment samples. Endrin, an insecticide, was also detected in Sed-5 at a level greater than 3 times background. (Ref. 27)

While these compounds were not detected in on-site surficial soil samples taken during the ESI, these compounds were found in samples taken directly from sediments which visually appeared to be contaminated by leachate. Endrin and bis(2-Ethylhexyl)phthalate were found in samples taken from on-site soil borings during the SSI.

5.3.3 Lake sediment samples

Two sediments samples were collected along Pigs Eye Lake to determine potential contaminant migration from the landfill to the lake. Sample Sed-7 was collected along a small bay of the lake located adjacent to the Site. This location was selected since it was in an area of discolored sediments and soils, and where there was various debris scattered on the surface along the shoreline. Sample Sed-9 was collected on the south side of Pigs Eye Lake near a location that is or was apparently used as a boat landing.

5.3.3.1 Inorganic sample results

Most metals were found to be in higher concentrations in sample Sed-7 than in Sed-9. Again, several of the compounds detected were qualified based on high recovery during calibration and thus were biased high. However, zinc(879 mg/kg) was found in concentrations at levels 10 times those found in the background sample and cadmium(9.6 mg/kg) was detected in Sed-7 while not in background.

Two compounds detected, lead and mercury, were found in Sed-7, and were not qualified. Lead was found at a level of 100 mg/kg which was greater than 3 times background and mercury was found at 0.75 mg/kg while not being detected in the background sample.

All inorganic compounds detected in Sed-7 were also detected in on-site surficial soil samples taken in the ash disposal area.

5.3.3.2 Organic sample results

Several organic semi-volatile compounds, such as bis(2-Ethylhexyl)phthalate and Indeno(1,2,3-cd)pyrene were detected in sample Sed-7 and not in the background lake sample. In addition, Aroclor-1254 was detected at a level of 7,900 ug/kg and not detected in the background lake sample. Aroclor-1254 was also detected in on-site soil sample SS-2.

6.0 PATHWAYS OF CONCERN

6.1 Soil Exposure

Surficial soil samples were not taken during the SSI and thus were necessary during the ESI to document a soil exposure threat. Sample results from the ESI documented surficial soil contamination in the upper two feet. As stated, the landfill size is approximately 307 acres, with the ash disposal area consisting of 31 acres over the abandoned landfill.

The city of St. Paul does have an active wood chipping facility on the western portion of the Site, although the facility is located greater than 200 feet from the ash disposal area and across Battle Creek. (Ref. 1,4)

There does appear to be some recreational use, such as fishing along Battle Creek. The Site is within the boundaries of the Federally designated Mississippi National River and Recreation Reach. Currently the Site is unfenced and is accessible to the public. (Ref. 1,2,4,10,13)

The Site also can be considered to be a terrestrial sensitive environment for both Bald Eagles and Peregrine Falcons, which are known to use the Site. Each are known to nest in the area and were seen on-site during the SSI by MPCA staff. Minnesota Department of Natural Resources (DNR) staff have confirmed that Bald Eagles and Peregrine Falcons do nest in the area and the Site can be considered to be part of their habitat. (Ref. 1,2,11,12,36)

6.2 Surface Water

Sediment samples collected during the ESI from Battle Creek and Pigs Eye Lake do document a release of hazardous substances to each surface water body, by chemical analysis. (Ref. 5,6)

An observed release to surface water can also be documented by direct observation. Prior to landfill operation, this area was a wetland as indicated by historical aerial photos, topo maps and landfill plan maps. In addition, the area around Pigs Eye Lake was classified under Grassland - Wet Prairies, Marshes and Sloughs, according to The Original Vegetation of Minnesota map published by the U.S. Department of Agriculture Forest Service in 1974. (Ref. 8,9,35,38)

Wetland vegetation is still evident on site, and along Battle Creek which flows through the Site. Battle Creek is still classified as a wetland by the Minnesota DNR. Wetlands are also located along the shore of Pigs Eye Lake on and adjacent to the Site. (Ref. 4,7)

During the landfill operation, wastes were deposited directly to the wetlands. Soil boring logs from the SSI do indicate waste and fill material in contact with swamp deposits. Sample results from the SSI taken from this fill material show the fill does contain hazardous substances. (Ref. 1,2,9,35)

6.2.1 Surface water targets

The on-site actually affected wetland frontage can be considered to be the perimeter of the landfill. Based on the size of the landfill being 307 acres, this could mean an approximate wetland frontage of between 2 and 2.5 miles. Pigs Eye Lake also has a shoreline of approximately 5 miles, 2.5 miles of which could be considered to be potentially affected wetland frontage. (Ref. 7,23,26)

Both Pigs Eye Lake and Battle Creek can be considered to be fisheries. The Minnesota Department of Health does maintain a fish consumption advisory for the lake, as a result of PCB contamination. Battle Creek is contiguous to the lake and it is possible for fish to migrate up into the creek. Minnesota DNR staff have stated that fishing does occur in both the creek and lake. (Ref. 1,4,13,14,15)

As stated under the Soil Pathway section, the Site is within the boundaries of the Mississippi National River and Recreation Area and is a habitat known to be used by federally listed endangered species. (Ref. 10,11,12)

The DNR also maintains a heron rookery on the western shore of Pigs Eye Lake and is classified as a State Natural Area. The rookery is within 1 to 2 miles of the Site. (Ref. 3,11,12)

Battle Creek is a small creek with average flows estimated to be less than 10 cubic feet per second (cfs). Battle Creek is the main source of flow into Pigs Eye Lake, with other flows into the lake being surface runoff or natural springs. Pigs Eye Lake subsequently discharges to the Mississippi River approximately 2 to 3 miles from the Site, although during high water levels the river may back up into the lake. (Ref. 3,23,24,25)

The Mississippi River is a large river with flows estimated to be greater than 10,000 cfs. The river is a major recreational area used for boating and fishing. Wetlands located along the Mississippi River may be potentially exposed to contaminants from the Site. The river may also be a habitat for the Higgins' eye pearly mussel, a federally listed endangered species. (Ref. 1,2,3,16,24,25,37)

There are no known drinking water intakes located within 15 miles downstream of the Site. (Ref. 1,2)

6.3 Ground Water

The Pigs Eye Landfill was not lined during its operation and based on current and previous sampling results by the MPCA, ground water is likely being impacted at the Site. City of St. Paul records do indicate private residential wells within 3 miles of the Site are being used for drinking water. Some of these residences may be as close as 1/4 mile from the Site. The cities of Oakdale and Woodbury also may have municipal drinking water wells within 4 miles of the Site. (Ref. 1,3,31,32)

Ground water within 4 miles of the Site is also used for commercial and industrial purposes. (Ref. 1,2,33)

6.4 Air

In 1988, the site caught fire from an unknown source and burned for several weeks. Air monitoring done by Bay West, a MPCA contractor, indicated hydrogen cyanide being emitted in the smoke. This was determined by use of Draeger tubes. If Draeger tube analysis is determined to accurately measure specific contaminant migration, an observed release could be documented by direct observation. (Ref. 1,2,28)

Organic vapor analyzer (OVA) monitoring done during the SSI indicated readings of up to 1000 ppm organic vapors while drilling soil borings. Since waste material may still be uncovered, there is a potential for migration of particulates or gases from the site. (Ref. 1,4)

Ash deposited at the Site appears to have less than one foot of uncontaminated topsoil for cover. The Site is, however, heavily vegetated. (Ref. 4,5,20,34)

Based on the combined population densities for Ramsey, Dakota and Washington Counties, there may be greater than 40,000 people living within 4 miles of the site. In addition, downtown St. Paul, the State Capitol complex, and MPCA and DNR offices are within 3 miles of the Site. (Ref. 3,29,30)

7.0 SUMMARY AND CONCLUSIONS

Based on MPCA investigative work for both the SSI and ESI, the Site appears to be directly impacting the environment and may be indirectly impacting public health. Contaminants present at the site are likely to be impacting ground water. These contaminants also appear to be impacting surface water through either ground water discharge to surface water or through surficial runoff from the Site.

An observed release to surface waters on and adjacent to the Site can be documented by chemical analysis. Six sediment samples taken in Battle Creek and Pigs Eye Lake confirm a release of hazardous substances, most notably metals. Metals found in sediment samples are likely to have migrated from ash deposited on-site, either through surficial run-off or through ground water discharge.

Levels of contaminants found were either not detected in background samples or were significantly above background. Both Battle Creek and Pigs Eye Lake can be considered to be fisheries for scoring purposes. This area is also a known habitat for Bald Eagles and Peregrine Falcons. The Site itself lies within the boundaries of the Federally designated Mississippi National River and Recreation Area.

An observed release to surface waters can also be documented by Direct Observation. Information available from city of St. Paul records indicate this area was a wetland prior to waste disposal and that waste material was deposited directly to the wetlands. Samples collected during the SSI indicate that the fill material is in contact with swamp deposits and that the fill material contains hazardous substances. Available information also indicates that the Site was flooded during operation of the landfill.

Sediment samples collected during the ESI were taken in areas where there visually appeared to be leachate seeping into Battle Creek. These samples did contain volatile and semi-volatile compounds not detected in background samples or detected significantly above background.

Surficial soil samples taken in the ash disposal area indicated high levels of metal concentrations in the upper two feet of soil. Metals found were consistent with information provided by MWCC as to the metals content of the ash. As previously stated, this area can be considered to be a terrestrial sensitive habitat known to be used by endangered species. The Site is accessible to the public and is a habitat for numerous wildlife.

Ground water contamination is likely since the landfill was not lined during its operations and sampling done by the MPCA since closure indicates migration of contaminants, primarily metals, from the Site. Contaminants are also likely to be impacting surface water via ground water discharge.

Air migration of contaminants is also potential since the Site has had a history of fires, both during its operation and after the landfill was closed. Wind migration of contaminated soils and/or particulates is also possible. Additional documentation will be necessary to identify exact targets for the ground water and air pathways.

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